CLAIMS

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    1.   A method of branding a gemstone diamond comprising:

directing a focused ion beam at the gemstone diamond to be branded and

10   manipulating the beam such that the beam impacts the surface of the gemstone diamond at a number of specified locations for a specified amount of time at each location to graphitize a portion of the gemstone diamond in the shape of a desired design.

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    2.   The method of claim 1 wherein the focused ion beam is manipulated by a computer.

20   3.   The method of claim 1 wherein the design is not visible to the naked human eye.

    4.   The method of claim 3 wherein the design is less than 25   250 micrometers wide at its widest point.

    5.   The method of claim 3 wherein the design is between 30   about 7 nanometers and 250 micrometers wide at its widest point.

    6.   The method of claim 1 wherein the focused ion beam is composed of Gallium

35   ions.

7.   The method of claim 1 further comprising removing the graphitized portions of the gemstone diamond so that the design is carved into the surface of the gemstone diamond.

8.   The method of claim 1 wherein the gemstone diamond is coated with a conductive layer.

9.   The method of claim 8 wherein the conductive layer is carbon.

10.   The method of claim 1 wherein the gemstone diamond is exposed to a charge neutralizer.

11.   A method of branding a gemstone diamond comprising the steps of:

securing the gemstone diamond onto a holder capable of being used in a coordinate transfer system;

using the coordinate transfer system to create mapping data which represents the distances between the location on the gemstone diamond which will be branded and certain set reference points on the holder;

using the mapping data to manipulate a focused ion beam machine such that it produces a focused ion beam which impacts the gemstone diamond at a desired location for a desired length of time to brand to design onto the gemstone diamond.

12.   The method of claim 11 further comprising generating design data which represents the design to be branded onto the gemstone diamond; and using the design data in conjunction with the mapping data to manipulate the focused ion beam.

13.   The method of claim 11 further comprising the step of coating the gemstone diamond with a layer of conductive coating.

14.   The method of claim 13 wherein the charged particles are carbon.

15.   The method of claim 11 wherein the holder is conductive.

16.   The method of claim 15 wherein the holder is aluminum.

17.   The method of claim 15 wherein the holder is copper.

18.   The method of claim 11 wherein the holder is capable of holding more than one gemstone diamond at a time.

19.   The method of claim 11 wherein the holder is portable.

20.   The method of claim 10 wherein the holder includes at least three reference points.

21.   The method of claim 11 wherein the coordinate transfer system identifies at least three reference points on the holder and determines the mapping data which comprises at least a horizontal offset, a vertical offset, and a rotational offset.

22.   The method of claim 21 wherein the mapping data is determined for more than one gemstone diamond.

23.   The method of claim 12 wherein the design data is converted into stream files
which comprise data representing the design in the form of pixels and offsets from a local coordinate system.

24.   The method of claim 23 wherein the ion beam is manipulated to impact the gemstone diamond such that the gemstone diamond is branded wherein each impacted area corresponds to one pixel of the design.

25.   The method of claim 12 further comprises the step of relating a local coordinate system associated with the design to be branded on the gemstone diamond to a global coordinate system associated with the mapping data.

26.   The method of claim 11 wherein the focused ion beam brands the gemstone diamond by converting a portion of the gemstone diamond into graphite.

27.   The method of 26 further comprising the step of removing the graphite.

28.   The method of claim 27 wherein the graphite is removed by exposing the branded gemstone diamond to potassium nitrate.

29.   The method of claim 27 wherein the graphite is removed by exposing the branded gemstone diamond to plasma.

30.   The method of claim 11 wherein a voltage applied to produce the ion beam is manipulated such that the computer is able to vary how far the ion beam penetrates the surface of the gemstone diamond and how deeply the gemstone diamond is branded.

31.   An apparatus for branding a gemstone diamond comprising:

a coordinate transfer system controlled by a computer;

a focused ion beam machine manipulated by the computer;

one or more computer programs, performed by the computer attached to the coordinate transfer system, for generating mapping data which represent the distances between the location on the

gemstone diamond which will be branded and certain set reference points on the holder;

one or more computer programs, performed by the computer for using the mapping data to manipulate the focused ion beam machine such that it produces a focused ion beam which impacts a surface of the gemstone diamond at one or more desired locations for a predetermined length of time to brand the design onto the gemstone diamond.

32.   The apparatus of claim 31 further comprising one or more computer programs, performed by the computer, for generating design data which represent the design to be branded onto the gemstone diamond and using the design data in conjunction with the mapping data to manipulate the focused ion beam machine.

33.   The apparatus of claim 31 further comprising a second computer connected to the first computer wherein the first computer performs one or more computer programs for creating mapping data which represent the distances between the location on the gemstone diamond which will be branded and certain set reference points on the holder; and the second computer performs one or more computer programs for using the mapping data to manipulate the focused ion beam machine, such that it produces a focused ion beam which impacts the gemstone diamond at a desired

location for a desired length of time to brand the design onto the gemstone diamond.

5   34.   The apparatus of claim 33 further comprising a third computer connected to the first computer, wherein the third computer performs one or more computer programs for generating design data which represents the design to branded onto the gemstone diamond.

35.   The apparatus of claim 34 wherein the design is converted into stream files which comprise data representing the design in the form of pixels and offsets from a local coordinate system.

36.   The apparatus of claim 35 wherein the design is a bar-code.